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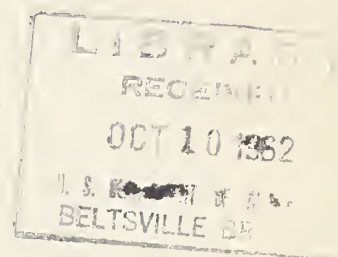
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FERTILIZER ATTACHMENT FOR TREE-PLANTING MACHINE:
A Progress Report

R. W. Starostka, R. E. MacBride, and W. C. Hulburt^{1/}



The U.S. Department of Agriculture and W. R. Grace and Company are cooperating in a study to test fertilizers designed expressly for silviculture and to develop an attachment to the tree-planting machine for applying the fertilizers at planting time. In the past few seasons, W. R. Grace and Company has developed such fertilizers. ^{2/} They are designed to make nutrients available to the trees for up to 2 years, depending on the size of the fertilizer particles.

One of the fertilizers being tested is an 8-40-0 fertilizer (magnesium ammonium phosphate). Because it is nonburning, it offers the possibility of safe contact with roots when applied at planting time. This safety feature is desirable, as separate placement of fertilizer is extremely difficult if not entirely impractical in soils where most trees are transplanted.

This progress report deals mainly with tests made during 1961 on the method of applying 8-40-0 fertilizer at planting time.

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- ^{1/} Supervisor and Agronomist, Agricultural Chemicals Research, W. R. Grace and Company, and W. C. Hulburt, Head, Planting and Fertilizing Equipment and Practices Investigations, Agricultural Engineering Research Division, Agricultural Research Service, U.S. Department of Agriculture, Beltsville, Md., respectively. Acknowledgment is given to H. J. Retzer and D. B. Eldredge, Research Agricultural Engineer and Engineering Technician, respectively, of Agricultural Engineering Research Division, Agricultural Research Service, for assistance in developing some of the special equipment used and in putting in some of the field trials of this cooperative study.
- ^{2/} Bridger, G. L., Salutsky, M. L., and Starostka, R. W. Metal Ammonium Phosphates as Fertilizers. Jour. Agr. & Food Chem. 10:181-188, 1962.

A fertilizer applicator was adapted for use with a heavy-duty tree planter (Lowther) ^{3/} for the 1961 tree-planting tests. The attachment consisted primarily of (1) a funnel and drop tube to the slotted standard or runner, (2) a seat, (3) two racks for fertilizer drums, and (4) a timing switch on one of the press wheels to activate a battery-operated buzzer. Details of the attachment are shown in figures 1 and 2. ^{4/}

Two men are required to use the fertilizer attachment. One man selects and meters the amount of fertilizer for each transplant. This man sits atop the machine between two drums of material and, on hearing the buzzer, drops measured cups of fertilizer into the funnel. The tree setter matches the plant with the strip of applied fertilizer. The length of the fertilizer band can be varied by changing ground speed of the machine or particle size of the fertilizer (figure 3). An alert operator can apply various amounts and kinds of fertilizer for each plot without stopping or slowing down the machine between plot treatments.

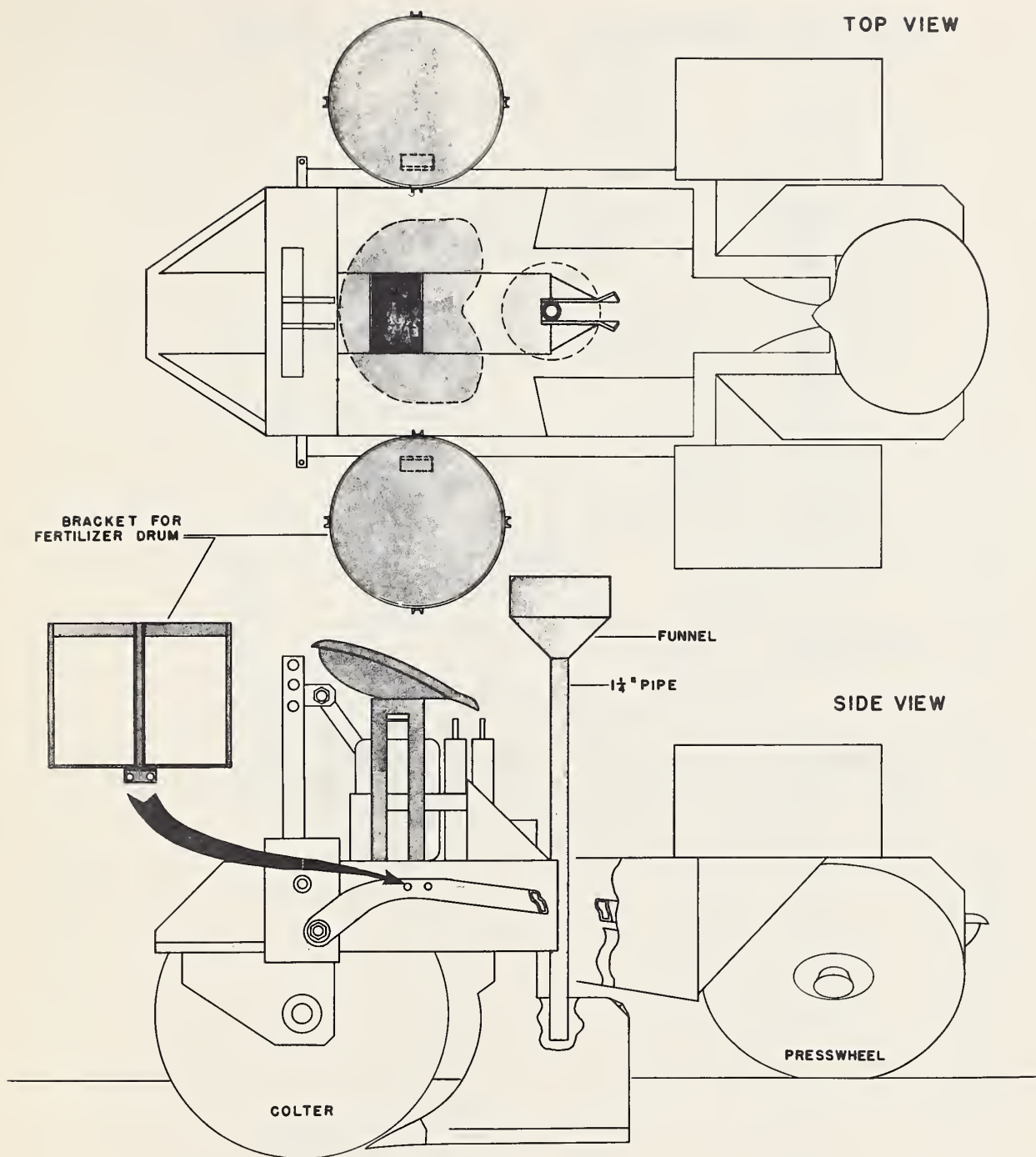
Trees were planted on experimental plots totaling about 30 acres during April 1961 at the Washington Research Center of W. R. Grace and Company, Clarksburg, Md., and on nearby Maryland State Park lands. Plantings included Norway spruce, black locust, loblolly pine, white pine, tulip poplar, red pine, larch, and Austrian pine. Treatments included no fertilizer (control), and 1, 2, 4, and 8 ounces of 8-40-0 fertilizer per seedling. Each plot had 36 trees, and the plots were replicated three times at each location.

Data obtained 4 months after planting indicated no significant differences in survival due to species, management, or fertilizer. Average survival for more than 10,000 fertilized trees was 92.3 percent.

Growth responses were measured 8 months after planting, and are expressed in terms of significant new growth and increase in diameter and in wood volume of trees fertilized with 8-40-0 as compared to the controls. Significant results are as follows: Austrian pine, 14.7 percent increase in diameter with 2 ounces of fertilizer; tulip poplar, 67.0 percent

^{3/} Mention in this publication of commercially manufactured equipment does not imply endorsement by the U.S. Department of Agriculture over similar equipment not mentioned.

^{4/} Prints of the experimental fertilizer attachment at the scale of the original drawing can be obtained from the Agricultural Engineering Research Division, Agricultural Research Service, U.S. Department of Agriculture, Beltsville, Md.



FERTILIZER ATTACHMENT FOR TREE PLANTER

ADDED PARTS ARE SHADED

SCALE IN INCHES
12 0 2 4 6 8 10 12

Figure 1 - Fertilizer Attachment for Tree Planter

ELECTRICAL SIGNALER DIAGRAM

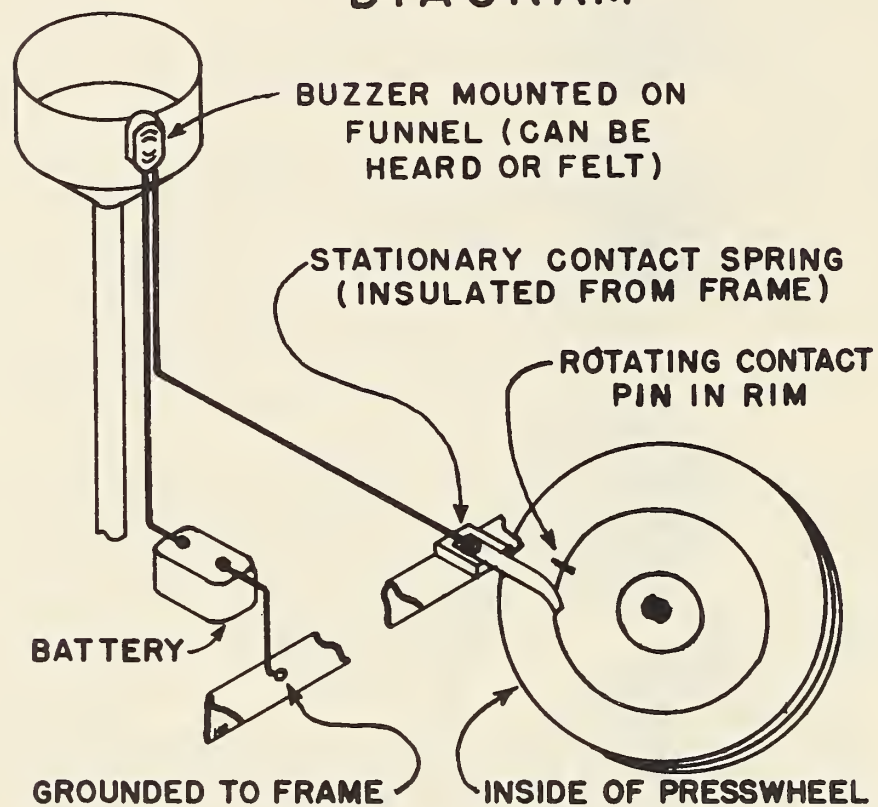
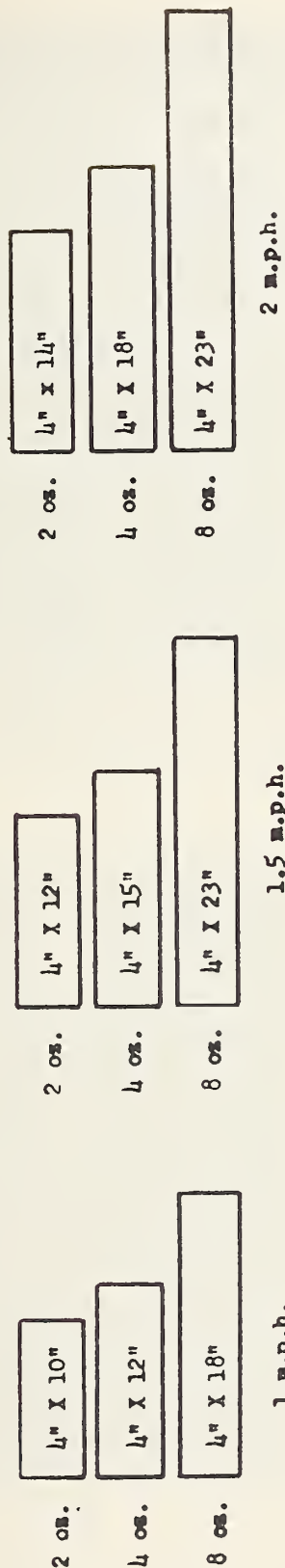


Figure 2 - Electrical Signaler Diagram

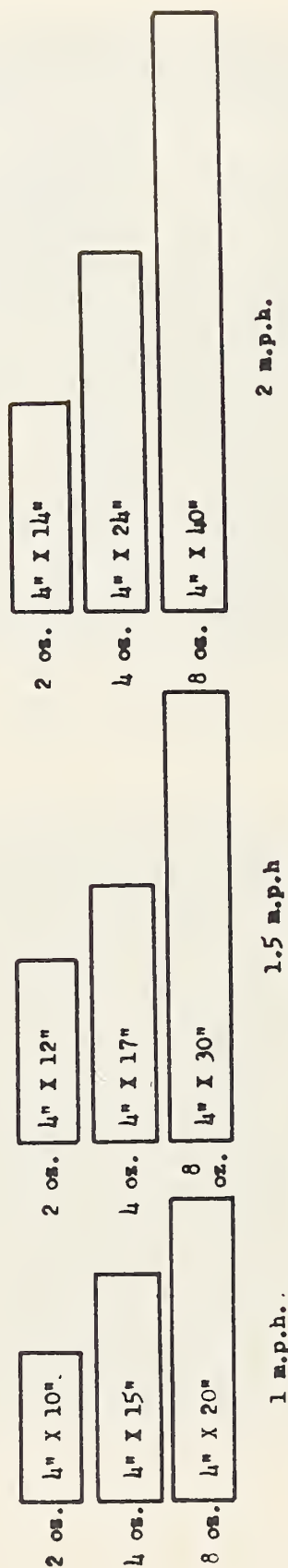
DIMENSIONS OF FERTILIZER BANDS

- 6 + 16 MESH



- 5 -

- 3 + 8 MESH



Data taken by W. R. Grace & Company Research Division using 1-1/4" pipe, 37" long.
 Graph made by Planting & Fertilizing Equipment & Practices Investigations, AERD, ARS, USDA.

Figure 3 - Dimensions of Fertilizer Bands

increase in wood volume with 8 ounces; black locust, 307.0 percent increase in wood volume with 4 ounces, loblolly pine, 34.8 and 40.5 percent increase in new growth with 1 and 2 ounces, respectively. Differences for the other varieties and treatments were not significant.

In a few of the field trials, a semiautomatic transplanter (Powell) with a fertilizer attachment was adapted to tree planting and was used in conjunction with the heavy-duty tree planter. It was used to study mechanical selection and setting of seedling, continuous banding versus hill placement of fertilizer, and planting at the right-angle intersection of two slots with and without fertilizer (similar to check-row planting for better branching of roots). The spacing of seedlings and the hills or strips of fertilizer could be varied by timing mechanisms rather than by relying on ground speed, diameter of press wheels, or size of particles.

Although a heavy-duty runner, a large size colter, and other rugged construction materials were used, the semiautomatic transplanter was not strong enough to serve adequately on most tree-planting sites. In most studies with this second planter, the heavy-duty tree planter was run through the plot strips to fracture the slot before the lighter machine was used to plant and fertilize the seedlings.

Current research and field trials are being directed toward developing fertilizer attachments for commercial tree planters that can be operated mechanically rather than manually.



Dropping fertilizer into conduit



Conduit in planting shoe



Fertilizer at bottom of
planting slit



Fertilizing while planting



Growth Through Agricultural Progress